Marked Copy of Amendments

In the Specification:

ABSTRACT

This invention is directed to methods for treating radioactive-containing waste materials. [More specifically, the present invention relates to the prevention of radon emissions.]Even more specifically, this invention relates to the prevention of radon emissions by encapsulating the radon in radon-generating waste matter using a chemical additive. Alternatively, the amount of radon escaping into the environment may be minimized by adjusting the shape of the carrier which stores the radon generating waste matter. Additionally, the first two embodiments may be combined to ensure that the radon does not escape into the environment. Finally, polymer sealants may be used as an additional barrier layer.

In the Claims:

1. (Twice Amended) A method for preventing alpha particle radiation emissions from being emitted from radioactive material-containing waste material into an environment comprising:

admixing a polymer with the waste material to encapsulate the radioactive material within the polymer wherein the polymer prevents alpha particle radiation emissions from passing through the polymer.

12. (Twice Amended) A method of reducing alpha particle radiation emissions from emitting from radioactive material-containing waste material comprising:

forming the waste material into a geometric shape having a volume per unit surface area, wherein the waste material has a smaller surface area thereby reducing the emissions of alpha particle radiation from the waste material.

22. (Twice Amended) A method for preventing alpha particle radiation emissions from being emitted from radioactive material-containing waste material into an environment comprising:

admixing a polymer with the waste material to form a first admixture, wherein the polymer encapsulates the radioactive material and prevents alpha particle radiation emissions from passing through the polymer;

admixing the first admixture with a shielding material to form a second admixture, wherein the first admixture is incorporated within the second admixture; and

forming the second admixture into a geometric shape having a volume per unit surface area , wherein the alpha particle radiation has less surface area through which to leave the second admixture.

REMARKS

The present invention is directed to method for treating radon-generating waste materials to reduce and substantially prevent alpha particle emissions from escaping from the waste materials and endangering individuals handling the waste materials.

Claims 1-29 are pending in this application. Claim 30 is canceled without prejudice. Claims 1, 12 and 22 and the Abstract are amended. No new matter has been added to the Application by the following amendments. Support for the amendments can be found throughout the specification. Applicants respectfully request consideration of the claims in view of the following amendments and foregoing remarks.

1. Amendments to the Specification

In the Office Action dated January 15, 2002, the Abstract of the disclosure was objected to because the second sentence merely repeated information given in the title. As per the Examiner's suggestion, the second sentence was deleted placing the Abstract in the proper format.

Applicants respectfully request the objection to the Abstract be withdrawn in light of the amendment.

2. Rejection of Claim 30 under 35 U.S.C. § 112, second paragraph

In the Office Action dated January 15, 2002, Claim 30 was rejected under 35 U.S.C. § 112 as being indefinite in that it failed to point out what is included by the claim language. The Office Action indicated that this was an omnibus type claim.

Claim 30 is canceled thus rendering the Examiner's rejection obviated.

3. Rejection of Claims 1-30 under U.S.C. § 103

In the Office Action mailed January 15, 2002, Claims 1-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Allen 5,551,976.

Regarding Claims 1, 12, 22 and 30, the Office Action indicated that "Allen describes a method for the disposal of radioactive waste comprising: admixing a polymer with the waste material to encapsulate the waste within the polymer wherein the polymer prevents radiation

from passing through, further mixing the polymer-waste admixture with a shielding material wherein the polymer-waste admixture with a shielding material wherein the polymer-waste mixture is incorporated within the shielding material, and forming the final mixture into solidified, round geometric shapes (which inherently have a high unit to volume surface area compared to thin sheets or rods) to further improve overall performance."

Specifically, the Examiner indicated that even though alpha particle emissions were not disclosed in Allen, it would have been obvious to one of ordinary skill in the art that the disposal of radioactive waste meant all radioactive waste including alpha particle. Applicants respectfully traverse this rejection.

Applicants' invention is directed to a method for treating alpha particle generating waste materials to reduce and substantially prevent alpha particle emissions from escaping from the waste materials and endangering individuals handling the waste materials.

Allen describes a method for the disposal of hazardous chemical and/or radioactive waste by preparing a solidified waste containing a monolithic solid containing a hydraulic cement, a filler having chemical and/or radioactive toxic waste contaminants, and a superplasticizer (column 2, lines 50-55).

It is the invention as a whole that must be considered under 35 U.S.C. § 103. *See e.g. In re Antonie*, 559 F.2d 618, 195 U.S.P.Q. 6 (C.C.P.A. 1977). It is respectfully submitted that although one of ordinary skill in the art may interpret radioactive waste to include alpha particle radioactive waste, Applicants' invention is directed to the prevention of the alpha particle emissions not the alpha particles themselves. It is well known in the art that the alpha particle emissions, in which Applicants' invention is directed, are gaseous emissions, specifically radon (page 1, lines 29-30). This fact makes the emission extremely mobile. This fact would allow it to diffuse out of any concrete stabilized radioactive waste, such as described in Allen, via any exposed surface, cracks, etc. It is this emission that causes an exposure hazard to personnel attending the waste and to the surround environment (page 2, lines 16-30). Applicants' invention uses a polymer to encapsulate the emissions and retain it inside the final waste form long enough for it to decay to a solid particulate radionuclide (page 4, lines 8-11).

If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the

proposed modification. *In re Gordon*, 733 F.2d 900, 221 U.S. P.Q. 1125 (Fed. Cir. 1984). Allen fails to describe the polymer encapsulating process to prevent emissions. The process described in Allen for cement and concrete stabilization is directed to solid radioactive waste (column 3, line 65; column 4, lines 61-62; column 5, lines 42-43) and this application would fail to prevent emissions. Therefore, it would be inappropriate in the present invention for one of ordinary skill in the art to interpret radioactive waste, as described in Allen, to include all radioactive waste as gaseous radioactive waste would cause Allen to be unsatisfactory for its intended purpose. In light of the previous amendments and remarks, it is respectfully requested that the rejection for Claims 1, 12 and 22 be removed as they present patentable material and are in condition for allowance.

Claim 30 is canceled and thus renders Examiner's rejection obviated.

Regarding Claims 2, 13 and 23, the Examiner indicated that Allen described the radioactive material as radon.

It is respectfully submitted that Claims 2, 13 and 23 depend from claims in which Allen fails to teach or suggest all of the claim limitations, as described above, and therefore fails to establish obviousness. In light of the previous remarks, it is respectfully requested that the rejection of Claims 2, 13 and 23 be removed as they present patentable material and are in condition for allowance.

Regarding Claims 3, 4, 19, 20, 24 and 25, the Examiner indicated that Allen describes the polymer selected from mineral oil, charcoal, activated carbon, silicates, sulfur, organic polymers or inorganic polymers. The Examiner also indicated Allen discloses the polymer added in an amount from about 0.1% to about 30% by weight based on the amount of waste material. Applicants respectfully traverse this rejection.

Applicants' claimed invention is directed to encapsulating radioactive waste with a polymer to prevent alpha particle emissions (page 7, lines 21-23).

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). The polymer described in Allen is a superplasticizer. Superplasticizers are

well known in the concrete industry for improving the properties of concrete due to the reduction in water content needed to be added to the concrete mixture. As applied in Allen, the superplasticizer allows for concrete that is more easily compacted, has a smaller volume and has an enhanced comprehensive strength (column 3, lines 15-40). The polymers described in Allen improve the physical characteristics of concrete, whereas the polymers in Applicants' invention serve to encapsulate the radioactive waste material and prevent alpha particle emissions. Therefore, Allen fails to teach or suggest the encapsulating process claimed in Applicants' invention and fails to render Applicants' invention obvious. In light of the previous remarks, it is respectfully requested that the rejection of Claims 3, 4, 19, 20, 24 and 25 be removed as they present patentable material and are in condition for allowance.

Regarding Claims 5, 11, 17, 21 and 29, the Examiner indicated that Allen describes disposal by sealing the polymer/waste material in molded forms, such as blocks stored in landfills. Applicants respectfully traverse this rejection.

Applicants' invention is directed to applying a polymer sealant to an the exterior of the polymer/waste material admixture to further prevent further alpha particle emission from escaping the waste material (page 5, lines 33-34).

It is respectfully submitted, as noted above, to establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981. Allen describes a methods of storage for radioactive material including depositing the waste in subterranean formations such as caverns or fissures (column 1, lines 65-67), petroleum or geothermal wells (column 2, line 1), abandoned mines (column 2, line 2) and molded forms such as blocks stored in landfills (column 2, lines 2-3). Allen is directed to methods of storage, whereas Applicants' invention describes a method of further treatment of the radioactive waste. Therefore, Allen fails to teach or suggest the further treatment of the radioactive waste by storing it as a molded form and thus fails to render Applicants' invention obvious. In light of the previous remarks, it is respectfully requested that the rejection of Claims 5, 11, 17, 21 and 29 be removed as they present patentable material and are in condition for allowance.

Regarding Claims 6-8, 15-16 and 26-27, the Examiner indicates that Allen describes mixing the polymer waster material with a shielding material such that the polymer-waste material is incorporated with the shielding material, by mixing it with concrete. Further the Examiner indicated Allen describes the amount of shielding material in a ratio from about 2 to 1. Applicants respectfully traverse this rejection.

It is respectfully submitted that Claims 6-8, 15-16 and 26-27 depend from claims in which Allen fails to teach or suggest all of the claim limitations, as described above, and therefore fails to establish obviousness. In light of the previous remarks, it is respectfully requested that the rejection of Claims 5, 11, 17, 21 and 29 be removed as they present patentable material and are in condition for allowance.

Regarding Claims 9, 10, 14 and 28, the Examiner indicates that Allen describes a geometric shape with a high volume per unit surface area selected from a substantially spherical or cubic shape to further improve overall performance.

It is respectfully submitted that Claims 9, 10, 14 and 28 depend from claims in which Allen fails to teach or suggest all of the claim limitations, as described above, and therefore fails to establish obviousness. In light of the previous remarks, it is respectfully requested that the rejection of Claims 9, 10, 14 and 28 be removed as they present patentable material and are in condition for allowance.

Regarding Claim 18, the Examiner indicates Allen describes mixing a polymer with the waste material to encapsulate the radioactive material to prevent radiation from passing through. Applicants respectfully traverse this rejection.

Applicants rely upon the previous remarks regarding the rejection of Claims 1, 12 and 22 and respectfully submit that Allen fails to teach or suggest the encapsulation process claimed by Applicants. In light of the previous remarks, it is respectfully requested that the rejection of Claim 18 be removed as it presents patentable material and is in condition for allowance.

4. Conclusion

For at least the reasons give above, Applicants respectfully submit that all pending Claims define patentable subject matter. Accordingly, Applicants respectfully request allowance of these Claims. Should the Examiner believe that anything further is necessary in order to place the application in better condition for allowance, the Examiner is respectfully requested to contact Applicants' representative at the telephone number listed below.

Respectfully submitted,

By: Theodore M. Green
Reg. No. 41,801

Kilpatrick Stockton, LLP
Suite 2800
1100 Peachtree St.
Atlanta, GA 30309-4530
Phone: 404-745-2415
Our Docket: 16715-0121 (44861-236277)

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